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THE IMPLICATIONS OF DEBT HETEROGENEITY FOR R&D INVESTMENT AND FIRM PERFORMANCE

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An assumption in prior research is that debt is homogeneous and provides inappropriate governance for R&D investments. We argue that debt is heterogeneous: although transactional debt does indeed impose strict contractual constraints that provide inappropriate governance for R&D investments, relational debt has very different characteristics that provide more appropriate governance. Using a sample of Japanese firms, we find that firms that align their debt structures with their R&D investments perform better than those that are misaligned. Furthermore, firms tend to align their debt structure with R&D investments, but only after deregulation permits relatively free access to various types of debt.

Investments in R&D can help to build capabilities that enhance competitive advantage (Franko, 1989), but they are subject to serious exchange hazards that require strong governance safeguards (Hill & Snell, 1988). According to transaction cost economics, debt and equity are alternative governance structures for safeguarding the capital invested in a firm, with the suitability of each depending on the type of investment made by the firm (Williamson, 1988). As investments in R&D generate intangible assets that serve as poor collateral, lenders of debt are reluctant to fund such investments (Kochhar, 1996; Long & Malitz, 1985; Williamson, 1988). Furthermore, the rigidity of debt contracts can impair the financial flexibility needed to pursue a sustained program of R&D investment (O'Brien, 2003). Thus, prior research has concluded that debt provides inappropriate governance safeguards for R&D investments, and empirical tests have shown that debt and R&D intensity are negatively associated (Balakrishnan & Fox, 1993; Long & Malitz, 1985; Vincente-Lorente, 2001).

Debt is a critical source of funds for most firms, accounting for over 90 percent of all new external financing (Corbett & Jenkinson, 1997; Mayer, 1988). Likewise, strategic investment in R&D is an important use of funds for generating economic returns (Franko, 1989). Thus, the governance implications of debt for R&D investment have enormous practical significance for managerial decisions about how best to finance strategic investments. We contend that the conclusion that debt provides inappropriate governance for R&D requires reevaluation, as it rests on an assumption that debt is homogeneous. In contrast, research on financial intermediation (see Boot [2000] for a review) indicates critical differences between private loans (i.e., "relational debt") and public securities (i.e., "transactional debt"). We theorize that although the rigid contractual constraints of transactional debt are indeed inappropriate for R&D investments, relational debt is congruent with R&D investment for three reasons. First, relational lenders help safeguard the continuity of investment in R&D by helping defaulting firms to work through liquidity problems, rather than automatically forcing them into bankruptcy. Second, they closely monitor borrowers to obtain the subjective information needed for such active intervention. Finally, as relational debt is private, it does not require public information disclosure, thus helping to limit appropriation of the proprietary knowledge from R&D by competitors.

Using transaction cost economics, we first explain the differences between "market" and "hierarchical" governance, the attributes of investments that pose contractual hazards, and why hierarchy

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provides more appropriate governance for investments involving high contractual hazards (Williamson, 1991). We then describe the hazards associated with R&D investments and why debt has generally been regarded as providing inappropriate governance (Williamson, 1988). Finally, we draw on the financial intermediation literature to show that debt is heterogeneous (Boot, 2000), comprising two types with divergent implications for R&D investments. Analyzing a large sample of Japanese firms over a 20-year period of deregulation, we find that firms enhance their performance by aligning their debt structures with their R&D investments. Furthermore, firms tend to align their debt structures with R&D investments over time, but only after deregulation permits relatively free access to various types of debt.

THEORY AND HYPOTHESES

Investments by transacting parties are subject to hazard because "bounded rationality" makes it impossible to specify resolutions for all future contingencies, and opportunism makes it difficult to rely on promises to equitably resolve ex post disputes. Thus, governance mechanisms are needed to help transacting parties "fill gaps, correct errors, and adapt more effectively to unanticipated disturbances" (Williamson, 1988: 570). According to Williamson (1991), markets and hierarchies are alternate governance mechanisms that differ in three critical attributes. The first of these attributes is dispute resolution. Under market governance, parties resolve disputes by strict adherence to contractual terms that are adjudicated by courts; under hierarchy, court intervention is eschewed, and parties resolve disputes internally by tempering administrative fiat with forbearance. The second attribute is adaptation. Under markets, parties rely on high-powered incentives to facilitate spontaneous adaptation; under hierarchies, they utilize administrative mechanisms to foster intentional adaptation. The third attribute is compliance monitoring. Under markets, relatively simple mechanisms are used to evaluate objective contractual criteria; under hierarchies, more elaborate monitoring of subjective criteria is used.

The choice of governance mechanism is shaped by the extent to which investments by transacting parties are subject to three types of hazards: (1) asset specificity, which is the extent to which investments lose value when redeployed to alternate uses, (2) uncertainty about the states of nature and the behavior of other parties, and (3) the appropriability of the returns arising from a transaction. When hazards are low, markets constitute the efficient governance choice. When hazards are high, however, transactions require stronger safeguards to preserve the mutual gains that arise from maintaining the continuity of exchange. Thus, although hierarchies sacrifice the high-powered incentives of markets and entail higher set-up and monitoring costs, they provide stronger safeguards than markets and are therefore appropriate when hazards are high.

Williamson's Debt-Equity Framework

Firms obtain a generic asset (i.e., cash) from investors and in turn make strategic investments, some of which may entail significant exchange hazards. Williamson (1988) argued that debt and equity represent alternative governance mechanisms for safeguarding this capital. Financiers require safeguards to ensure that their investments provide appropriate returns, and managers require safeguards to induce them to make "hazardous" investments. As our discussion above on the three attributes of dispute resolution, adaptation, and monitoring indicates, debt and equity can be viewed as providing market and hierarchical governance, respectively.

For dispute resolution, lenders rely on court adjudication (i.e., bankruptcy law) to enforce strict adherence to contracts that specify interest rates, terms of repayment, and liquidity covenants. Owners of equity, by contrast, are not guaranteed any returns contractually and must rely on the "forbearance law" administered by boards of directors to resolve disputes with managers. As for adaptation, debt affords considerable autonomy to managers, and relies on the high-powered incentives of the threat of bankruptcy to induce spontaneous adaptation by managers. Equity owners, by contrast, rely on the boards' exercise of administrative authority over managers to guide intentional adaptation. Finally, debt precludes the need for elaborate monitoring mechanisms, as objective data are sufficient to verify conformance to payment and covenant terms. By contrast, to protect their investment, equity owners use an elaborate monitoring mechanism (a board of directors), which encompasses subjective criteria.

Hazards Associated with R&D and the Inappropriateness of Debt

Asset specificity. Investments in R&D create knowledge-based intangible assets that have the greatest value when utilized in conjunction with a firm's complementary assets (Helfat, 1994). Because these investments lose considerable value if

bankruptcy forces redeployment outside the firm, they do not serve as good collateral for lenders (Long & Malitz, 1985). Furthermore, the necessity of meeting payment terms can reduce financial flexibility, and the possibility of unanticipated liquidity problems can induce managers to curtail ongoing R&D programs (O'Brien, 2003), thereby disrupting the continuity of R&D investment that is vital for the accumulation and absorption of knowledge (Dierickx & Cool, 1989).

Uncertainty. Evaluating the efficacy of R&D investments is difficult because of the considerable time lag between investment and payoff (Laverty, 1996) and the many external factors and events that may arise during the interim and can affect ultimate payoffs (Hill & Snell, 1988). Evaluation criteria also involve highly qualitative judgments, including the probability of success, congruence with current technologies, fit with other ongoing projects, the strategic importance of a project to a firm (Osawa & Murakami, 2002), and indirect or spillover benefits (Oral, Kettani, & Lang, 1991). This uncertainty results in acute hazards from potential adverse selection (the borrowers most likely to be credit risks are the ones most likely to seek financing) and moral hazard (after borrowers obtain financing they may take actions to shift risks onto lenders). Overcoming these problems requires detailed qualitative and subjective information. The elaborate subjective monitoring by boards of directors (Baysinger & Hoskisson, 1990) provides owners the strong safeguards required to resolve the problems of adverse selection and moral hazard, while simple objective monitoring by lenders does not.

Appropriability. The returns to investments in R&D are subject to weak appropriability, as the leakage of information about a firm's R&D programs can lead to imitation by competitors (Teece, 1986). Even legal safeguards such as patents are often ineffective, as competitors are often able to engineer around the patents (Levin, Klevorick, Nelson, & Winter, 1987). Equity owners can monitor investments in R&D via the board of directors, a body that can generally be entrusted to protect critical strategic information from leakage. However, providing assurance to lenders that the firm is making appropriate investments in R&D would require the public disclosure of detailed data on the R&D projects, which would necessarily weaken the appropriability regime for the investments and erode managers' motivation to make such investments (Bhattacharya & Chiesa, 1995).

Thus, notwithstanding the stronger incentives and lower monitoring and administrative costs associated with debt, it fails to provide adequate safeguards against the exchange hazards posed by R&D. Empirical evidence supports the contention that firms that invest heavily in R&D eschew debt and favor equity financing (Balakrishnan & Fox, 1993; O'Brien, 2003; Vincente-Lorente, 2001).

The Heterogeneity of Debt

Although transaction cost economics sheds considerable light on the link between strategy and capital structure, an important gap remains. So far, we have followed previous work on this topic by treating debt as homogeneous, as did Williamson (1988). All debt contracts share several common characteristics, such as contractually specified repayment terms and covenants, and the threat of bankruptcy in the event of default. However, the financial intermediation literature has shown that debt is heterogeneous (we draw extensively from a comprehensive review by Boot [2000]). Following the terminology used in the theory of contracts (Macneil, 1974; Rousseau, 1995), we classify debt contracts into two types: *transactional debt* has simple performance attributes and a fixed time period; *relational debt* has extended duration and complex performance attributes.

Bonds and commercial paper are issued in specific monetary denominations and sold to individuals and institutions in arms'-length capital markets. For holders of these debt securities, the performance attribute is simple: the direct returns available from holding the securities constitute performance. The period of contract duration is fixed by the maturity of the securities issue and, in practice, is even shorter, as these securities can generally be readily traded in active secondary markets (Boot, 2000). Bonds are classified as transactional because they involve simple performance criteria and a fixed time horizon. In contrast to bonds, loans are private transactions between a firm and financial intermediaries such as banks and insurance companies. These transactions are typically part of a long-term relationship wherein the lenders generally "roll over" the loans and also provide additional business services, such as letters of credit, check clearance, and cash management. The performance criteria employed by the lenders are complex; the multiple sources of potential returns and the indefinite duration of the lending relationship must be considered. Loans are therefore considered relational debt. Using the three attributes of governance mechanisms (i.e., dispute resolution, adaptation, and monitoring), we explain why transactional debt provides market governance similar to what Williamson (1988) described, while rela-

tional debt is more aptly characterized as hierarchical governance.

Dispute resolution. Transactional lenders consider only the direct returns from debt, and they thus adhere strictly to contract law by committing to liquidate borrowers in the event of default. Relational lenders, in contrast, consider the indefinite duration of the multiple sources of revenue from the borrowers, and thus they are motivated to employ forbearance and help struggling clients by renegotiating or relaxing loan terms and providing additional funds (Boot, 2000). Exercising forbearance may also help attract new clients by enhancing a bank's reputation (Chemmanur & Fulghieri, 1994). Furthermore, debt renegotiation is feasible for relational lenders because it requires agreement from a relatively small number of concentrated lenders (Gorton & Kahn, 2000). In contrast, transactional lenders have neither the motivation to be forbearing (they lack multiple business ties with borrower firms), nor the ability (renegotiation is infeasible because transactional debt is generally diffusely held). Empirical evidence supports the premise that relational lenders exercise forbearance, as financially distressed firms that rely on relational debt are more likely to both continue to make strategic investments (Hoshi, Kashyap, & Scharfstein, 1990) and to successfully restructure and avoid bankruptcy (Gilson, John, & Lang, 1990).

Adaptation. As relational lenders often exercise forbearance to work out problems, they cannot rely on high-powered incentives (e.g., the threat of bankruptcy) to induce borrowers to spontaneously adapt to changing circumstances and must therefore employ administrative mechanisms for intentional adaptation. Relational lenders gain administrative control in two ways. First, they often obtain board representation (Kaplan & Minton, 1994). Second, they combine tight covenants and selective enforcement to obtain de facto administrative control. Relational debt contracts have more stringent covenants than transactional debt (Smith & Warner, 1979). By selectively enforcing covenant violations and threatening borrowers with default, relational lenders can force renegotiation and thereby effectively gain a measure of administrative control (Berlin & Mester, 1992). Renegotiation after covenant violation allows banks to actively intervene in a firm's operations by imposing demands, such as the liquidation of specific projects and the redirection of strategic investments (Gorton & Kahn, 2000).

Monitoring. The exercise of forbearance and administrative control requires access to detailed subjective information. Banks accumulate proprietary information on client firms through their "multiple interactions with the same customer over time across products" (Boot, 2000: 10). Also, banks often obtain seats on client firms' boards of directors (Kaplan & Minton, 1994), thus bolstering the banks' access to proprietary information. Relational lenders are therefore better able to evaluate both firms' ongoing projects and their financial positions. Finally, relational lenders not only have access to more detailed and subjective information, but also have the motivation to gather it. Monitoring entails gathering specific information on clients, and relational lenders can amortize these sunk costs over both extended time horizons and multiple business relationships. In contrast, transactional debt tends to be diffusely held, and thus lenders lack the scale economies that would justify elaborate monitoring. Accordingly, transactional lenders rely solely on monitoring objective criteria that demonstrate conformance with debt terms.

In summary, relational and transactional debt employ different forms of governance. Transactional debt utilizes market governance; it relies on rigid contractual terms, high-powered incentives based on a credible threat of bankruptcy, and verifying conformance by monitoring objective data. These characteristics are essentially those offered by Williamson (1988) to describe debt in general. Relational debt, however, is quite different in that it utilizes hierarchical governance; it relies on lenders' exercising forbearance in response to financial shortfalls, employing administrative controls, and monitoring subjective performance criteria. Furthermore, these three attributes dovetail and reinforce each other. For relational debt, the monitoring of detailed subjective information makes it feasible to exercise administrative control, and administrative control in turn provides access to additional subjective information. Similarly, relational lenders do not display forbearance unless they have both subjective information to evaluate a firm's long-term prospects and the administrative controls necessary to influence investment patterns.

Whereas transactional lenders can verify compliance by objective financial criteria and intervene only in the event of default, relational lenders must utilize elaborate (and therefore costly) administrative and monitoring mechanisms. Furthermore, the propensity for relational lenders to exercise forbearance instead of forcing liquidation attenuates high-powered incentives. Whether or not these additional costs of hierarchical governance are warranted depends on the extent of contracting hazards associated with investments in a firm. Although some studies have explored differences between relational and transactional debt (Anderson & Makhija, 1999; Kang & Stulz, 2000), prior work has not addressed the governance implica-

tions of such differences for R&D investments. Below, we explain how relational debt appropriately governs the high transaction hazards associated with R&D, while transactional debt is inappropriate.

R&D and Type of Debt

Asset specificity. We have noted that the asset specificity of R&D undermines both lender proclivity to fund R&D and managerial incentives to invest in R&D. Relational debt is better suited to governing investments in R&D because, unlike transactional debt, it allows lenders to respond to unexpected disturbances with forbearance and help a firm work though difficulties. Thus, the low liquidation value of R&D investments is not as serious a concern for relational lenders as they can be forbearing and help the firm through liquidity problems, thus preserving the value of R&D investments. Furthermore, the likelihood of forbearance helps protect managerial incentives to maintain the continuity of investment in R&D, which is critical to realizing the benefits from an R&D program (Dierickx & Cool, 1989).

Uncertainty. Elaborate monitoring under relational debt reduces information asymmetries and thus helps to alleviate the exchange hazards of investments in R&D that arise from uncertainty. Because banks have multiple business relationships and those relationships are of indefinite duration, banks generally monitor a client before a loan is issued, while the loan is ongoing, and after the loan is repaid (Aoki & Patrick, 1994), thereby alleviating adverse selection and moral hazard problems. Furthermore, relational lenders' in-depth knowledge, in conjunction with the de facto administrative control that they gain over the client firm's investment activities, enables them to attenuate the moral hazard problem by potentially intervening and redirecting strategic investments in response to unforeseen contingencies.

Appropriability. As transactional debt is purchased and traded in public markets, public disclosure of information is needed. Relational debt, however, is a private transaction between a firm and a lender and does not require public disclosure, thus helping safeguard proprietary information about R&D from leakage. Therefore, relational debt provides stronger appropriability safeguards for investments in R&D (Bhattacharya & Chiesa, 1995).

Misalignment between debt structure and R&D can impose unnecessary costs, distort incentives, and impair firm performance. Firms with low R&D intensity are appropriately governed by the high-powered incentives and less invasive administrative and monitoring mechanisms of transactional debt. These firms do not need strong safeguards and would incur unnecessary transaction costs by utilizing relational debt. Conversely, R&D-intensive firms incur higher exchange hazards and require stronger safeguards. Although relational debt entails weaker performance incentives and higher monitoring and administrative costs, it provides the stronger governance safeguards necessary for R&D-intensive firms. Furthermore, the rigidity of transactional debt can disrupt R&D programs or delay new-product launches when cash shortfalls are experienced (O'Brien, 2003). Even during good times, anticipating that transactional lenders will be unlikely to forbear in the event of a downturn can undermine managerial commitment to risky long-term R&D projects. Additionally, keeping transactional lenders abreast of strategic initiatives would raise the risks of information leakage.

Prior research has demonstrated that misalignment between governance and strategic investments impairs performance in numerous contexts, such as the trucking industry (Nickerson & Silverman, 2003; Silverman, Nickerson, & Freeman, 1997), strategic alliances (Sampson, 2004), and international entry modes (Brouthers, 2002). Therefore, ceteris paribus, firms that deviate from the prescription of our theoretical model should experience performance shortfalls.

Hypothesis 1. R&D intensity and the ratio of relational debt to total debt interact positively with respect to their impact on performance.

As the failure to align governance structures with strategic investments leads to performance shortfalls, the pursuit of improved performance should induce most managers to eventually learn from their environment and their own actions and adopt appropriate governance structures. Even if managers fail to learn, governance mistakes will eventually be "corrected" by either replacement of the managers or the failure of inefficient firms (Williamson, 1985). Thus, competitive pressures should generally drive firms to adopt appropriate governance structures. The alignment of governance mechanisms with strategic investments predicted by transaction cost economics must, however, be qualified by an important practical consideration. Government regulations can affect access to various types of debt (Hoshi & Kashyap, 2001), and firms cannot adopt appropriate governance mechanisms if regulations constrain choice. Alignment is possible only if regulations permit firms to freely select their debt structures. Accordingly, we predict that firms that are free to choose

their debt structures will rely more heavily on relational debt (versus transactional debt) as R&D intensity increases.

Hypothesis 2. When firms can freely select their debt structures, R&D intensity is positively associated with the ratio of relational debt to total debt.

METHODS

Study Context

An empirical test of our theory requires a sample of firms that has access to both relational and transactional debt. Firms in many nations lack access to both forms of debt. In the United States, the restrictions imposed by the Glass-Steagall Banking Act of 1933 severely curtailed the close bank-firm ties that make relational banking feasible (Carosso, 1970). Although relational banking is still common for small firms, large public corporations in the United States rely largely on transactional debt (Allen & Gale, 2000). In contrast, relational debt from banks is a critical source of external financing in most other developed countries, such as Japan, Germany, and France (Allen & Gale, 2000). Japan provided a particularly useful context for our study because it has a longstanding tradition of relational banking and, following deregulation in the 1980s and 1990s, a readily accessible transactional debt market. Furthermore, as Nickerson and Silverman (2003) pointed out, deregulatory shocks provide a useful testing context for contrasting alignment patterns before deregulation (when choices are unavailable) and after deregulation (when firms have access to alternate governance mechanisms).

Corporate Governance in Japan

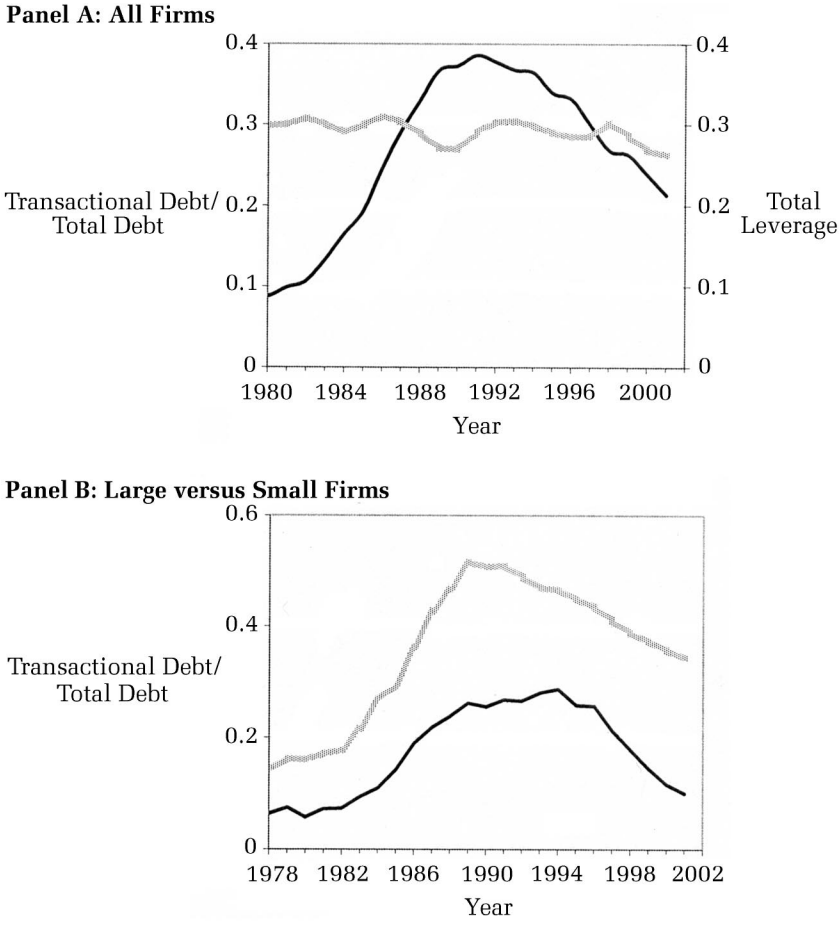
As most of the published work on corporate governance uses samples of U.S. corporations, we provide a brief overview of corporate governance in Japan, with an emphasis on debt (for a comprehensive treatment, see Hoshi and Kashyap [2001]). A major difference from U.S. firms is that Japanese firms tend to have close intercorporate ties and place considerable emphasis on implicit contracts founded on mutual trust (Abegglen & Stalk, 1985; Gerlach, 1992). Stable lender ties, termed a "main bank system," are a distinguishing feature of Japanese corporate governance (Aoki and Patrick [1994] provides a comprehensive overview). Most firms borrow from multiple banks but maintain a lending relationship with a main bank, and most banks operate as a main bank for at least some companies. In a risk-diversifying reciprocal arrangement, the main bank serves as the lead monitor of a de facto syndicate of other banks that are subordinate lenders. For other clients, this bank will likely be a subordinate lender and part of a syndicate that delegates monitoring to another main bank. Firms maintain settlement and payment accounts with main banks, and monitoring such accounts provides banks with subjective knowledge about firms' operational situations. Banks also often provide their clients valuable services related to mergers, acquisitions, divestitures, and strategic alliances. Senior bank employees commonly join the boards of firms, providing banks both information and influence. When a firm defaults, its main bank takes the lead in organizing a rescue.

As Hoshi and Kashyap (2001) explained, Japanese capital markets were historically highly regulated, and firms relied almost exclusively on relational lenders for debt. Then, in 1979, a long period of gradual deregulation began, culminating in 1996, when all bond issuing criteria were abolished. Some of the important events in the deregulation process were the clarification of overseas issuance criteria in 1982 and the significant easing of issuance criteria that occurred in the mid 1980s, in 1990, and again in 1992. As panel A of Figure 1 illustrates, our data show that transactional debt accounted for less than 10 percent of all debt for the average firm until 1982, when it suddenly began to climb sharply to a peak of near 40 percent in the early 1990s. Panel B of Figure 1 illustrates the differing patterns in transactional debt for small and large firms (with the size distinction based on a median split on total assets). Although transactional debt for large firms peaked in 1989, it did not peak for smaller firms until 1994. Overall, these data suggest that very few firms could access transactional debt before 1982 but that most firms could readily access it following the 1992 easing of issuance restrictions. Accordingly, in our empirical analyses, we distinguish between early (1982–92) and late (1993–2001) deregulatory periods, with the later period corresponding to relatively free access to the different types of debt.

Sample

Our sample began with all public Japanese firms listed in the Pacific-Basin Capital Markets (PACAP) database between the years 1982 and 2002. As market value information was missing for almost 90 percent of the observations for 2002, we dropped that year from the analysis out of concerns over possible bias. This left 2,111 firms and 33,714 firm-year observations. We excluded firms in the highly

FIGURE 1
Changes in Debt Structure over Time, 1980–2001[a]



[a] In panel A, the black line represents the ratio of transactional debt to total debt for the average firm in our sample, and the gray line represents total leverage for the average firm. Panel B depicts changes in transactional debt/total debt for large firms (shaded line) versus small firms (solid line). Firms above the yearly median for assets were classified as large; those below were classified as small.

regulated financial, public utilities, and communications sectors (about 900 observations). We also dropped approximately 3,300 observations for which the market value of equity was missing and approximately 1,800 observations for which the value of debt was zero. Finally, we deleted approximately 2,600 observations that had a book value of equity lower than 3 billion yen. These small firms were denied access to transactional debt prior to 1990 and may have had limited access subsequently owing to the economies of scale in bond issuance and accentuated information asymmetries (see Anderson & Makhija, 1999). With occasional missing data items, the final sample encompassed 1,853 firms and 24,320 firm-year observations. Data for all variables were obtained from the PACAP database, with the exception of data on R&D and advertising expenses, which were obtained from the Nikkei NEEDS database.

Variables

Dependent variables. Following prior research (Anderson & Makhija, 1999; Hoshi, Kashyap, & Scharfstein, 1993; Wu, Sercu, & Yao, 2001), we considered all bank loans to be relational debt and all bonds to be transactional debt. As Aoki and Patrick (1994) noted, a main bank leads a de facto lending syndicate and monitors firms on behalf of all other lenders, so it is appropriate to treat all bank loans as relational debt. The variable *relational debt* represents the sum of all bank loans divided by total debt, where total debt is the sum of all bank loans and all bonds outstanding. As it is problematic for a dependent variable to be bounded between 0 and 1, we transformed it by taking the natural logarithm of relational debt divided by one minus relational debt. Before the transformation, values of 0 and 1 were replaced by 0.001 and 0.999,

respectively. Results were qualitatively identical, however, if we did not transform this variable or if we used the arcsine transformation.

To serve as a proxy for a firm's performance, we used its market-to-book ratio. This measure, which closely corresponds to Tobin's *Q* (Chung & Pruitt, 1994), was appropriate because it incorporated not just current performance but also expected future performance. This measure was calculated as the sum of total debt and the market value of equity divided by total assets. Because this distribution was highly skewed, we constructed the variable *performance* by taking the natural log of the market-to-book ratio. Results were similar if performance was not logged.

Independent variables. Our main theoretical variable of interest, *R&D intensity,* was calculated as total research and development expenditures divided by total assets. We also controlled for other variables that may affect either the mix of debt or performance. *Total assets* was the natural log of the book value of assets, and *sales* was total firm sales (rescaled to trillions of yen). Sales was not logged because we found that logging it did not improve model fit, but would have created a multicollinearity problem (as it was correlated at .93 with logged assets). Analysis of variance inflation factors revealed that multicollinearity was not a problem in any of the models we report. Interest *coverage* was the income from operations less depreciation charges and divided by interest and discount charges. Although this variable was extremely skewed (and a poor predictor of relational debt), a log transformation was inappropriate because of both extreme positive and extreme negative values. Instead, we transformed the variable by replacing it with a percentile rank (scaled to be between 0 and 1) indicating each firm's interest coverage relative to all other firms.

The variable *fixed assets* was defined as net fixed assets divided by total assets. *ROA*, or return on assets, was operating income divided by total assets. *Advertising intensity* was total advertising expenditures divided by total assets. *Volatility* assessed the instability of a firm's earnings and was measured as the standard deviation of return on assets over the previous five years. Although all types of debt have both costs and benefits (see Harris & Raviv, 1991), our focus was on whether firm strategy influences the type of debt a firm selects, controlling for the absolute amount of debt. Hence, we controlled for overall firm *leverage*, which was defined as total debt divided by firm market value (the sum of total debt and the market value of equity). Furthermore, in our performance models, we also controlled for the interaction between R&D intensity and leverage (O'Brien, 2003). Finally, in addition to the firm-level control variables described above, we also included a number of industry-level control variables. For each industry, we used the median values for the corresponding firm-level variable measured in all firms for which that industry was primary to measure *industry performance, industry relational debt, industry leverage, industry ROA,* and *industry volatility*.

Analysis

Conducting our analysis presented several critical methodological considerations. First, unobserved heterogeneity was a concern because our data contained multiple observations per firm. To address this concern, we incorporated fixed firm effects in all our models. Fixed effects were deemed superior to random effects because our data encompassed virtually an entire population, rather than random draws from a population, thus undermining a key assumption of random effects (Wooldridge, 2003: 473). Finally, a Hausman test indicated that there was a significant ($p < .01$) systematic difference in the coefficients from random effects models versus fixed-effects models, indicating that fixed-effects models were more appropriate.

A second methodological consideration concerned modeling the variable for relational debt. As it may take time for firms to align their debt structures with their strategies, a dynamic panel data model that accounted for slow or partial adjustment in relational debt was required. Although including the lagged dependent variable as a predictor variable helps account for dynamic partial adjustment of the dependent variable, it also introduces bias into a model (see Nickell, 1981). Fortunately, Bruno (2005) described a method of correcting this bias in unbalanced dynamic panel data models employing dummy variables for (firm) fixed effects. Therefore, we employed Bruno's (2005) corrected least-squares dummy variable (LSDVC) approach to model relational debt. Although all three possible methods for correcting the bias offered by Bruno yielded similar results, we opted for the Blundell-Bond method because initial tests indicated that relational debt was highly persistent over time (see Bruno, 2004).

Finally, a third methodological consideration concerned modeling the variable for performance. As the market value of a firm can change rapidly in response to new information, modeling performance does not require a dynamic partial adjustment model. However, our theory-based prediction is that the variable R&D intensity impacts a firm's

choice between relational and transactional debt and that the interaction between type of debt and strategy impacts firm performance. Thus, in our performance model, both relational debt and its interaction with R&D intensity were endogenously determined. If the performance models failed to include every variable that influences both the endogenous variables and the dependent variable, then the endogenous variables would be correlated with the error term and hence, with use of traditional ordinary least squares methods we would suffer from omitted variables bias. We employed two-stage instrumental variables (IV) regression methods to eliminate this bias, by first regressing the endogenous variables on all the independent variables and then using predicted values of the endogenous variables in lieu of the observed values in the second stage, when performance was regressed on the predictor variables.

Before performing IV regressions, one must identify variables that can serve as valid instruments for the endogenous variables. These instruments are used, along with all the other variables in the performance equation, to produce predicted values for the endogenous variables. However, to avoid perfect collinearity, these instruments must be excluded from the performance equation. Thus, these variables needed to be strongly related to the endogenous variables but weakly related to performance. Although two instruments would constitute a just-identified model (given two endogenous variables), we used an overidentified model so that we could conduct a test of overidentifying restrictions (see Wooldridge, 2003: Ch. 15). This test allowed us to verify both that the instrumental variables were correctly excluded from the performance equation and that they were uncorrelated with the error term in the performance equation (i.e., they are exogenous, meeting a critical assumption of IV regressions). Exploratory regressions indicated that industry relational debt and the lag of relational debt might serve as valid instruments, and we created a third instrument by interacting industry relational debt with R&D intensity. Although serial correlation can be a concern when using the lag of an endogenous variable as an instrument, the overidentification tests helped confirm that the theoretically predetermined lag of relational was indeed exogenous (however, creating an instrument by interacting the lag of relational debt with R&D intensity would have created an endogeneity problem).

After determining the variables that were to be used as instrumental variables, and before proceeding with the analysis, we sought to verify that relational debt was indeed endogenous in the performance equation. Although IV regression methods provide improved estimates of the effect of an endogenous variable on a dependent variable, they are also less efficient, as they tend to produce much larger standard errors than OLS (Wooldridge, 2003: Ch. 15). Thus, even if a variable is theoretically endogenous, it is preferable not to model it as endogenous unless tests indicate that endogeneity induces a statistical problem. A Davidson-MacKinnon test of exogeneity confirmed that relational debt and its interaction with R&D intensity did indeed jointly create a significant endogeneity problem ($F = 28.4$, $p < .01$). Similar tests indicated that R&D intensity did not create an endogeneity problem in any of the models reported.

Finally, it should be noted that analysis of Cook's *D* statistics on preliminary regressions suggested that four outliers had a statistically significant impact on the performance models, and thus they were excluded from the analysis. Also, all models included year fixed effects (not reported) in addition to the firm fixed effects. Table 1 gives descriptive statistics for our sample.

RESULTS

Table 2 presents the results of tests of Hypothesis 1. Model 1 is a comparison model using standard fixed effects, and models 2 through 4 utilize two-stage IV regression analyses with firm fixed effects. For models 2 through 4, the Sargan overidentification test statistic was insignificant, confirming that the instrumental variables were indeed exogenous and correctly excluded from the performance equation. Furthermore, the test statistics (*F*s) for the first-stage regressions of these models (the unreported models for which the predicted values for the endogenous variables were estimated) were all well above 80, indicating that the instruments jointly served as good predictors of the endogenous variables. Also, the Wald chi-square was highly significant ($p < .01$) for models 2 through 4. Finally, it is worth noting that we do not report multiple squared correlation coefficients (R^2s) because this statistic has no natural interpretation in IV regressions. Although IV methods yield better estimates of the effect of an endogenous variable on a dependent variable, all else being equal, overall model goodness-of-fit is not a consideration and may very well decline when a variable is treated as endogenous (see Wooldridge, 2003: 494–495). Accordingly, it is also inappropriate to test whether inclusion of an endogenous variable improves overall model fit.

Model 1 of Table 2 suggests that relational debt has a significant, negative ($p < .01$) main effect on

TABLE 1
Descriptive Statistics[a]

Variable	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Performance	−0.02	0.53															
2. Relational debt	2.19	4.21	−.20														
3. Leverage	0.31	0.22	−.47	.19													
4. Total assets	11.33	1.25	.00	−.34	.21												
5. Fixed assets	0.26	0.15	.09	.00	.08	−.04											
6. Sales	0.26	1.05	−.04	−.06	.15	.45	−.13										
7. Coverage	0.51	0.29	.11	−.22	−.59	−.11	.11	−.12									
8. ROA	0.04	0.04	.40	−.09	−.42	−.06	.02	−.06	.55								
9. Volatility	0.02	0.01	.14	.06	−.11	−.20	−.02	−.10	−.06	−.01							
10. Advertising intensity	0.01	0.03	.06	−.06	−.17	.01	−.04	−.02	.09	.11	.01						
11. R&D	0.01	0.02	.18	−.12	−.19	.12	−.07	.01	.15	.11	.07	.05					
12. Industry performance	−0.05	0.35	.67	−.16	−.40	−.06	.11	−.07	−.02	.19	.11	.09	.11				
13. Industry ROA	0.04	0.02	.37	−.04	−.26	−.08	.04	−.07	.02	.39	.01	.20	.04	.53			
14. Industry volatility	0.01	0.01	.19	−.06	−.17	−.13	−.07	−.10	−.04	−.01	.40	−.06	.13	.28	.05		
15. Industry leverage	0.30	0.13	−.50	.17	.50	.14	.11	.07	−.13	−.18	−.12	−.14	−.21	−.73	−.49	−.31	
16. Industry relational debt	0.80	0.17	−.29	.28	.24	−.03	−.08	.05	−.12	.00	−.06	−.02	−.20	−.44	−.05	−.14	.43

[a] n = 24,320. All correlations with an absolute value greater than .02 are significant at .05.

TABLE 2
Results of Instrumental Variables Regression Analysis on Performance[a]

Variables[b]	Model 1: 1982–2001	Model 2: 1982–2001	Model 3: 1982–1992	Model 4: 1993–2001
Constant	0.38** (0.09)	0.46** (0.10)	0.30* (0.15)	0.17 (0.31)
Firm				
Relational debt (i)	−0.01** (0.00)	−0.02** (0.00)	−0.01** (0.00)	−0.08** (0.01)
Leverage	−0.66** (0.02)	−0.66** (0.02)	−1.13** (0.03)	−0.70** (0.04)
Total assets	−0.01 (0.01)	−0.01 (0.01)	0.01 (0.01)	0.03 (0.03)
Fixed assets	−0.04 (0.03)	−0.05 (0.03)	−0.17** (0.05)	0.18* (0.09)
Sales	−0.04** (0.01)	−0.03** (0.01)	−0.02* (0.01)	−0.03 (0.02)
Coverage	−0.28** (0.01)	−0.26** (0.01)	−0.17** (0.02)	−0.24** (0.03)
ROA	3.63** (0.08)	3.59** (0.08)	2.09** (0.11)	3.60** (0.20)
Volatility	2.11** (0.16)	2.14** (0.17)	0.87** (0.21)	3.86** (0.47)
Advertising	−1.22** (0.14)	−1.34** (0.16)	−1.54** (0.20)	−1.35* (0.59)
R&D intensity	3.67** (0.30)	−0.89 (0.51)	−1.38 (0.78)	−12.77** (2.48)
Industry				
Performance	0.68** (0.02)	0.65** (0.02)	0.66** (0.02)	0.57** (0.06)
ROA	−2.15** (0.22)	−2.45** (0.24)	−1.34** (0.30)	−2.31** (0.66)
Volatility	−1.92** (0.64)	−3.36** (0.70)	−2.94** (0.94)	−5.10** (1.77)
Leverage	0.03 (0.04)	0.05 (0.04)	0.28** (0.06)	0.00 (0.10)
Interactions				
Relational debt × R&D intensity (i)	0.02 (0.03)	1.80** (0.16)	1.18** (0.21)	6.43** (0.91)
Leverage × R&D intensity	−13.26** (0.88)	−12.33** (0.95)	−7.57** (1.84)	−9.19** (2.09)
n	24,320	24,320	12,056	12,264
Wald χ^2		37,605	28,557	9,683
Sargan's test		0.80	3.18	0.03

[a] Values in parentheses are standard errors. All models include firm and year fixed effects (not reported).
[b] The notation "(i)" indicates that the variable was "instrumented" in models 2 through 6.
* $p < .05$
** $p < .01$
Two-tailed tests.

performance, but the interaction with R&D intensity has no impact. However, as described above, we know that both relational debt and its interaction with R&D intensity are endogenous and significantly biased in this model. Model 2 shows that when endogeneity is properly accounted for, the

interaction between these two variables is positive and significant ($p < .01$), supporting Hypothesis 1. This finding suggests that the governance provided by relational debt becomes more appropriate as R&D intensity increases. Models 3 and 4 further support Hypothesis 1 by showing that the significant, positive interaction ($p < .01$) holds in both the early (1982–92) and late (1993–2001) deregulatory periods. Finally, in an unreported model, a variant of the Chow test employing interactions with time period dummies (Wooldridge, 2003: 431–432) revealed that the joint influences of type of debt and R&D intensity on performance were significantly different ($p < .01$) in the late and early deregulatory periods.

Table 3 presents the results of the least squares dummy variable corrected (LSDVC) regression analyses that were used to test whether firms responded to deregulation by aligning debt structure with their R&D intensity (Hypothesis 2). Model 1, a dynamic random effects generalized least squares (GLS) model presented for comparison purposes only, suggests that R&D intensity has a significant, positive influence ($p < .01$) on relational debt. Although this effect remains significant in model 2, in which we employed the LSDVC technique to correct for bias, the coefficient barely reached significance at a less stringent level ($p < .05$). This result is not particularly surprising, given that the full sample window encompasses very different regulatory environments. Supporting Hypothesis 2, we found that when we divided the sample into early and late deregulatory periods, there was a strong, significant, positive relationship ($p < .01$) between R&D intensity and relational debt in the late deregulatory period, but not in the early period.

To assess the economic significance of our results, we used models 3 and 4 of Table 2 to produce predicted values for firm performance and then converted these values back to market-to-book ratios. Figure 2 presents graphs of the interactive equations. Panel A depicts the early deregulatory period, and panel B depicts the late deregulatory period. In each panel, R&D intensity is plotted along the x-axis from the 10th to the 90th percentile. The lines labeled "high relational" represent firms at the 90th percentile of *relational* debt (which roughly equates to complete reliance on relational debt), and "low relational" indicates the 10th percentile (almost complete reliance on transactional debt). In both periods, firms that relied primarily on relational debt experienced strong, positive returns to R&D investment, and firms that relied primarily on transactional debt experienced negative returns (although the economic impact was stronger in the later period). Furthermore,

TABLE 3
Results of Least Squares Dummy Variable Corrected Regression Analyses on Relational Debt[a]

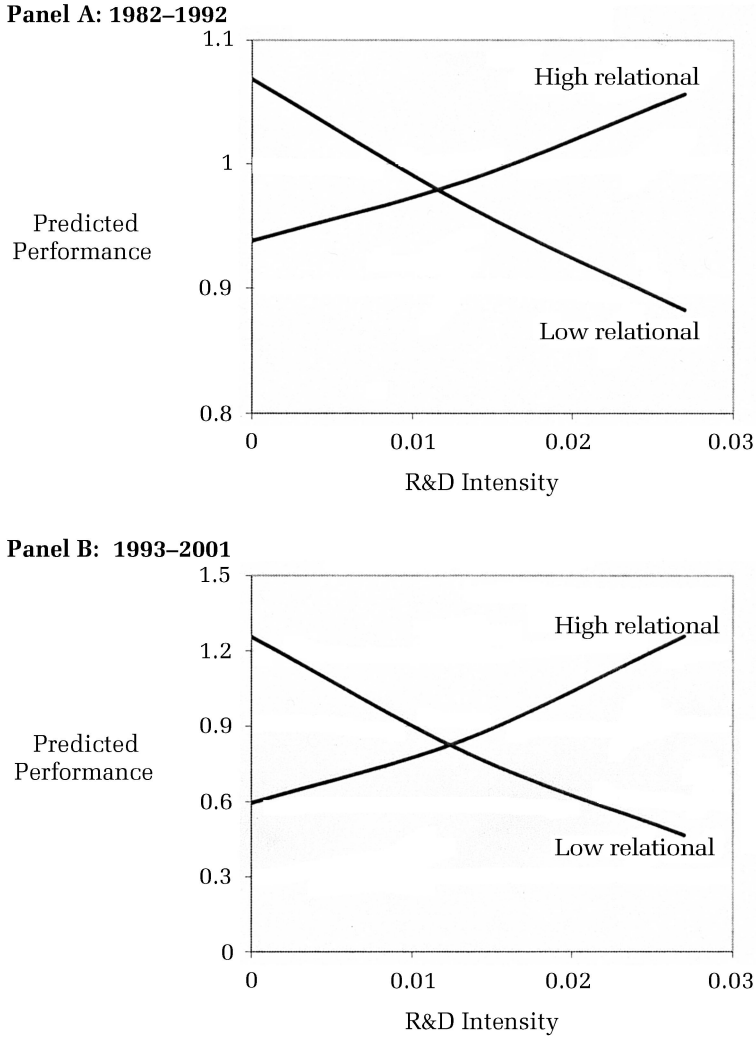
Variables	Model 1: 1982–2001	Model 2: 1982–2001	Model 3: 1982–1992	Model 4: 1993–2001
Firm				
Lagged relational debt	0.87** (0.00)	0.79** (0.01)	0.74** (0.01)	0.80** (0.01)
Leverage	−0.32** (0.09)	−1.03** (0.13)	−2.13** (0.27)	−1.30** (0.19)
Total assets	−0.18** (0.01)	−0.63** (0.06)	−0.91** (0.15)	−0.54** (0.11)
Sales	0.03** (0.01)	0.16** (0.05)	0.08 (0.09)	0.16 (0.09)
Fixed assets	0.46** (0.09)	1.56** (0.21)	1.28 (0.67)	2.97** (0.34)
Coverage	−0.85** (0.07)	−0.72** (0.10)	−1.60** (0.25)	−0.23 (0.15)
ROA	−1.14** (0.43)	−1.25* (0.57)	−0.68 (1.28)	−0.24 (1.02)
Volatility	0.42 (0.88)	−0.29 (1.46)	−3.16 (2.16)	4.66* (1.84)
Advertising	0.02 (0.42)	−0.65 (3.24)	−8.17 (4.85)	4.14 (4.66)
R&D intensity	2.16** (0.76)	4.07* (2.00)	1.09 (4.60)	7.39** (2.88)
Industry				
Performance	−0.19* (0.08)	−0.37** (0.13)	−0.68** (0.25)	0.13 (0.28)
ROA	−1.33 (1.38)	−1.83 (1.82)	0.24 (2.46)	−3.04 (2.68)
Volatility	−5.08 (2.72)	−0.27 (6.36)	−4.56 (7.84)	−8.79 (9.80)
Leverage	0.20 (0.16)	0.65** (0.25)	1.91** (0.61)	0.59 (0.47)
Relational debt	0.70** (0.10)	0.95** (0.16)	1.24** (0.30)	0.89** (0.23)
n	24,320	24,319	12,056	12,264
F	–	882.13**	455**	341.11**

[a] Values in parentheses are standard errors. All models include year fixed effects (not reported). Models 2–4 include firm fixed effects (not reported).

* $p < .05$

** $p < .01$

FIGURE 2
Performance Implications of the Interaction between Type of Debt and R&D Intensity[a]



[a] In each panel, the x-axis plots R&D intensity from the 10th to the 90th percentile, and the y-axis gives predicted performance. "High relational" and "low relational" respectively represent firms at the 90th and 10th percentiles of relational debt. All other variables were held constant at their means.

firms favoring transactional debt appreciably "outperformed" those favoring relational debt at low levels of R&D intensity, while the converse was true at high levels of R&D intensity. This graph illustrates that the governance benefits of relational debt can exceed the costs incurred as firm-specific investments in R&D increase.

DISCUSSION

Using transaction cost economics, we developed and tested a causal model to explain why debt structure must align with R&D intensity, and the performance implications of misalignment. Analyzing a large sample of Japanese firms over 20 years of deregulation, we found support for our two hypotheses: (1) R&D-intensive firms that relied more heavily on relational debt outperformed those that relied more heavily on transactional debt, confirming that aligning debt structure with R&D confers performance advantages and (2) R&D intensity was associated with higher ratios of relational debt to total debt during the later phase of deregulation, suggesting that firms generally aligned their debt mix with their strategic investments once they were permitted relatively unrestricted access to the various types of debt.

In previous work exploring the relationship between R&D and capital structure, researchers have only distinguished between debt and equity, im-

plicitly assuming that debt is a relatively simple and homogeneous financial instrument. Our study challenges the accepted view by drawing on the financial intermediation literature to show that debt is a heterogeneous construct with divergent implications for R&D. Although some forms of debt conform to the arm's-length relationship described by Williamson (1988), other forms entail close ties and complex multifaceted relationships. By applying the core tenets of transaction cost economics to this elaborated description of debt, we reached the counterintuitive conclusion that the two forms of debt are not just subtly different, but are actually polar opposites in terms of their governance properties with respect to R&D investments. Transactional debt relies on market governance and cannot provide the strong exchange safeguards that investments in R&D require. Relational debt, however, provides the hierarchical governance that is necessary to align the interests and incentives of investors and the managers of R&D-intensive firms.

The heterogeneity of debt has strong practical implications for the managers of all firms, public and private, who must make decisions about sources of financing. Given its reliance on the assumption that debt is homogeneous, prior research would yield the incorrect conclusion that all firms with the same aggregate debt level provide comparable governance for R&D and that, hence, the choice of debt type is irrelevant. Our research shows, to the contrary, that failing to account for debt heterogeneity can have an economically profound impact on the returns to investments in R&D and thus provides useful guidance on the importance of a firm's selecting the right type of debt: the type that best aligns with the firm's strategic investments.

Theories are often influenced by the context most familiar to the theorist. As most large U.S. corporations tend to rely largely on transactional debt (Allen & Gale, 2000; Davis & Mizruchi, 1999), it is understandable why Williamson (1988) treated all debt as transactional. Likewise, Jensen (1986), in his argument that the governance properties of debt can reduce the agency costs of free cash flow, implicitly assumed that all debt was transactional. Prior empirical studies of the relationship between debt and R&D (Balakrishnan & Fox, 1993; Kochhar, 1996; Simerly & Li, 2000; Vincente-Lorente, 2001) also treated all debt as transactional. Although treating all debt as transactional is not an unreasonable generalization for U.S. corporations, theories based on this simplification lack generalizability to contexts where relational debt is commonly employed. These contexts include small firms within the United States, firms in many of the other developed nations in the world (Allen & Gale, 2000), and even a subset of major U.S. corporations that employ relational debt through ties with commercial banks (Mizruchi & Stearns, 1994). Our treatment of the divergent governance implications of relational and transactional debt yields a more broadly applicable theoretical framework.

Studying firms over a period marked by regulatory changes provides insights into the dynamics of the alignment of debt structure with R&D. As firms within our sample lacked free choice over their debt structures, it was not possible for them to align debt structure with strategic investments until deregulation was fairly advanced. Although competitive forces should induce governance alignment once deregulation permits such choice, alignment may not occur instantaneously for all firms. In fact, our finding that alignment conferred performance benefits even after deregulation actually suggests that many firms remained misaligned. As Masten (1993) pointed out, competitive advantage is always relative. If all firms made the correct governance choice, then making the correct choice would not lead to a competitive advantage and there would be no observable relationship between governance and performance. Possible explanations as to why misalignment persists include organizational inertia and adjustment costs (Nickerson & Silverman, 2003), bounded rationality resulting in managerial mistakes (Masten, 1993), and governance inseparability (Argyres & Liebeskind, 1999), whereby other firm activities require governance choices that limit alignment of debt structure with R&D. More research on the dynamics of and constraints on governance alignment could significantly advance both theory and practice.

Also warranted would be more research devoted to disentangling the divergent views on the governance role of Japanese banks. During the 1970s and 1980s, a period when Japanese firms prospered, the close ties between Japanese banks and firms were lauded for providing superior governance (Abegglen & Stalk, 1985). During the 1990s, however, the Japanese economy fared poorly, and the governance provided by Japanese banks was criticized for involving excessively close ties bordering on cronyism (Boyer, 2000). Rather than attempt blanket conclusions about whether relational debt always provides superior or inferior governance, we followed prior research in recognizing that most governance mechanisms likely have both benefits and drawbacks (Finkelstein & D'Aveni,

1994). Accordingly, we explored R&D investment as a possible context in which the benefits outweigh the drawbacks. We found that relational debt is superior to transactional debt for R&D investments and that misalignment of debt structure with R&D investments hurts firm performance. We have noted multiple reasons for misalignment, such as regulatory constraints in the early stages of deregulation and likely managerial mistakes in later stages. Yet regardless of the root cause, misalignment hurt firm performance in both time periods.

Interestingly, it is possible that the free access to debt following deregulation may have exacerbated misalignment for some firms. As deregulation progressed throughout the 1980s, some of the most creditworthy industrial firms paid down relational debt and turned to less expensive transactional debt. To replace lost business, banks began lending extensively to firms that were pouring money into generic assets like real estate during the bubble era of the 1980s (Hoshi & Kashyap, 2001). Although relational debt provides appropriate governance for specific investments like R&D, it is inappropriate for the governance of generic investments like real estate, to which the tight budget constraints and high-powered incentives of transactional debt are better suited. Consequently, when the economic bubble burst, these firms were unable to repay and saddled banks with bad debt. A report by Japan's Cabinet Office (2001) confirmed that less than 10 percent of the bad debts of banks during this crisis was in manufacturing industries (where assets tend to be more specific), while over 54 percent was in firms in the retail sector (which invested heavily in generic assets).

Several limitations of our study warranting further investigation remain. First, our study relied on archival measures of relational and transactional debt. Qualitative research on the extent to which banks exercise hierarchical governance should help provide finer-grained understanding of the implications for R&D investments. Second, although Japan was an appropriate setting for our study, debt regulations and bank relationships are somewhat idiosyncratic in every country. Replication of our study would better establish the extent to which our transaction cost economics arguments apply to other national contexts. Third, we followed prior research in treating R&D investments as homogeneous. However, research has pointed out that strategic investments can be heterogeneous, differing in the extent to which they are directed toward the exploration of new possibilities versus the exploitation of known certainties (March, 1991). Further research could clarify whether relational debt is equally beneficial for both forms of R&D. Fourth, we studied large firms that had access to bond markets. Although small firms often lack such access, they do vary in the extent to which they forge strong bank relationships. Investigating the implications of this variation for strategic investments would also be worthwhile. Finally, although we have advanced the literature by distinguishing between loan debt and bond debt, it is possible there are also important differences within loans and within bonds. For example, institutional investors with conflicting goals often hold bonds (Hoskisson, Hitt, Johnson, & Grossman, 2002), suggesting that further disaggregation may yield benefits.

Just as further disaggregating debt might prove enlightening, disaggregating equity owners might also provide further insights. Thus, like lenders of debt, owners of equity could be classified as transactional or relational on the basis of their use of either simple or complex performance criteria and either short or long time horizons. For example, Lee and O'Neill (2003), taking a stewardship perspective, argued that stable long-term owners of Japanese firms constitute "patient capital" that helps foster a long-term view of investments. A transaction cost economics perspective can complement the stewardship view by explaining the causal mechanism whereby patient (relational) owners provide the safeguards that help foster managerial stewardship with regard to R&D investments. Similarly, David, Yoshikawa, Chari, and Rasheed (2006) found that foreign owners, who tend to be more transient or short-term, induce Japanese firms to cut R&D. If transient owners can be characterized as transactional, then a transaction cost economics perspective can help to explain why the market governance provided by transactional ownership tends to reduce specific investments such as R&D. Furthermore, the distinction between relational and transactional owners is relevant not only for Japanese firms, but also for U.S. firms. Several studies have explored the implications of ownership structure for strategic investments such as R&D in U.S. firms. Large block ownership (Hill & Snell, 1988), long-term pension fund ownership (Hoskisson et al., 2002), and activism (David, Hitt, & Gimeno, 2001) have all been found to favor R&D. Conversely, transient (as opposed to dedicated) institutional owners curtail R&D investments when faced with earnings shortfall (Bushee, 1998). These studies suggest that there is considerable promise in exploring the extent to which different types of owners can be classified as relational versus transactional, and the implications of such ownership for strategic investments such as R&D.

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